

CLAIMS

1. A method for stabilizing reduced coenzyme Q₁₀ which comprises obtaining a composition by admixing
5 reduced coenzyme Q₁₀ with a fat and oil (excluding olive oil) and/or a polyol as the main component in which the stabilization of reduced coenzyme Q₁₀ is not substantially inhibited and thereby protecting reduced coenzyme Q₁₀ against oxidation.
- 10 2. The method according to Claim 1, wherein the fat and oil comprises at least one fat and oil selected from among coconut oil, palm oil, palm kernel oil, linseed oil, camellia oil, brown rice germ oil, avocado oil, rapeseed oil, rice oil, peanut oil, corn oil,
15 wheat germ oil, soybean oil, perilla oil, cottonseed oil, sunflower seed oil, kapok oil, evening primrose oil, shea butter, sal fat, cacao butter, sesame oil, safflower oil, lard, milk fat, fish oil, and beef tallow, modified fat and oil derived from these by fractionation, hydrogenation,
20 transesterification or the like, medium-chain fatty acid triglycerides, fatty acid partial glycerides, and phospholipids.
- 25 3. The method according to Claim 1 or 2, wherein the polyol comprises at least one polyol selected from among glycerol, propylene glycol and polyethylene glycol.
- 30 4. The method according to any one of Claims 1 to 3, wherein the fat and oil/(fat and oil + polyol) weight ratio is not lower than 1/10.
- 35 5. The method according to any one of Claims 1 to

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wherein the content of vitamin E, when the same is further contained in the composition, is lower than 4% by weight based on the system excluding coenzyme Q₁₀.

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6. The method according to any one of Claims 1 to 5,

wherein the content of a Tween and/or Span species, when the same is further contained in the composition, is not higher than 30% by weight based on the system excluding coenzyme Q₁₀.

7. The method according to any one of Claims 1 to 6,
15 wherein the content of the fat and oil and/or polyol in the composition is not lower than 50% by weight based on the system excluding coenzyme Q₁₀.

8. The method according to any one of Claims 1 to 20 7,
wherein the content of reduced coenzyme Q₁₀ in the composition is higher than 5% by weight.

9. The method according to any one of Claims 1 to 25 8,
wherein the reduced coenzyme Q₁₀ is an externally added one.

10. The method according to any one of Claims 1 to 30 9
which is carried out in a deoxygenized atmosphere.

11. The method according to any one of Claims 1 to 10,
35 wherein the fat and oil and/or polyol is one accepted

for food or pharmaceutical use.

12. The method according to any one of Claims 1 to 11,

5 wherein the percent retention of reduced coenzyme Q₁₀ after 3 days storage in the air at 40°C under a light-shielded condition is not lower than 95%, with the percent retention in the corresponding composition composed of reduced coenzyme Q₁₀, the fat and oil and/or polyol alone
10 after storage under the same conditions being taken as 100%.

13. A composition

which comprises reduced coenzyme Q₁₀, a fat and oil (exclusive of olive oil) and/or a polyol and in which the
15 stabilization of reduced coenzyme Q₁₀ is not substantially inhibited.

14. The composition according to Claim 13,

wherein the fat and oil comprises at least one fat
20 and oil selected from among coconut oil, palm oil, palm kernel oil, linseed oil, camellia oil, brown rice germ oil, avocado oil, rapeseed oil, rice oil, peanut oil, corn oil, wheat germ oil, soybean oil, perilla oil, cottonseed oil, sunflower seed oil, kapok oil, evening primrose oil, shea
25 butter, sal fat, cacao butter, sesame oil, safflower oil, lard, milk fat, fish oil, and beef tallow, modified fat and oil derived from these by fractionation, hydrogenation, transesterification or the like, medium-chain fatty acid triglycerides, fatty acid partial glycerides, and
30 phospholipids.

15. The composition according to Claim 13 or 14,

wherein the polyol comprises at least one polyol selected from among glycerol, propylene glycol and
35 polyethylene glycol.

16. The composition according to any one of Claims
13 to 15,

wherein the fat and oil/(fat and oil + polyol) weight
5 ratio is not lower than 1/10.

17. The composition according to any one of Claims
13 to 16,

wherein the content of vitamin E, when the same is
10 further contained in the composition, is lower than 4% by
weight based on the system excluding coenzyme Q₁₀.

18. The composition according to any one of Claims
13 to 17,

15 wherein the content of a Tween and/or Span species,
when the same is further contained in the composition, is
not higher than 30% by weight based on the system excluding
coenzyme Q₁₀.

19. The composition according to any one of Claims
20 13 to 18,

wherein the content of the fat and oil and/or polyol
in the composition is not lower than 50% by weight based on
the system excluding coenzyme Q₁₀.

25 20. The composition according to any one of Claims
13 to 19,

wherein the content of reduced coenzyme Q₁₀ in the
composition is higher than 5% by weight.

30 21. The composition according to any one of Claims
13 to 20,

wherein any oxidation product derived from a reducing
agent to reduce oxidized coenzyme Q₁₀ is substantially
35 absent.

22. The composition according to any one of Claims
13 to 21,

5 wherein the reduced coenzyme Q₁₀ is an externally
added one.

23. The composition according to any one of Claims
13 to 22

10 which is prepared or stored in a deoxygenized
atmosphere.

24. The composition according to any one of Claims
13 to 23,

15 wherein the fat and oil and/or polyol is one accepted
for food or pharmaceutical use.

25. The composition according to any one of Claims
13 to 24

20 which is processed in an oral dosage form.

26. The composition according to Claim 25,
said dosage form being capsules.

25 27. The composition according to Claim 26,
said capsules being soft capsules.

28. The composition according to any one of Claims
13 to 27,

30 wherein the percent retention of reduced coenzyme Q₁₀
after 3 days storage in the air at 40°C under a light-
shielded condition is not lower than 95%, with the percent
retention in the corresponding composition composed of
reduced coenzyme Q₁₀, the fat and oil and/or polyol alone
after storage under the same conditions being taken as 100%.

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29. A reduced coenzyme Q₁₀-containing composition which comprises reduced coenzyme Q₁₀, a polyglycerol fatty acid ester, and a fat and oil and/or a polyol.

5 30. The composition according to Claim 29,
 wherein the fat and oil comprises at least one fat
 and oil selected from among coconut oil, palm oil, palm
 kernel oil, linseed oil, camellia oil, brown rice germ oil,
 avocado oil, rapeseed oil, rice oil, peanut oil, corn oil,
10 wheat germ oil, soybean oil, perilla oil, cottonseed oil,
 sunflower seed oil, kapok oil, evening primrose oil, shea
 butter, sal fat, cacao butter, sesame oil, safflower oil,
 olive oil, lard, milk fat, fish oil, and beef tallow,
 modified fat and oil derived from these by fractionation,
15 hydrogenation, transesterification or the like, medium-
 chain fatty acid triglycerides, fatty acid partial
 glycerides, and phospholipids.

 31. The composition according to Claim 29 or 30,
20 wherein the polyol comprises at least one polyol
 selected from among glycerol, propylene glycol and
 polyethylene glycol.

 32. The composition according to any one of Claims
25 29 to 31,
 wherein the fat and oil/(fat and oil + polyol) weight
 ratio is not lower than 1/10.

 33. The composition according to any one of Claims
30 29 to 32,
 wherein the content of the fat and oil and/or polyol
 in the composition is not lower than 50% by weight based on
 the system excluding coenzyme Q₁₀.

35 34. The composition according to any one of Claims

29 to 33

which further comprises an ascorbic acid.

35. The composition according to Claim 34,
5 wherein the ascorbic acid comprises at least one
species selected from among ascorbic acid, rhamnoascorbic
acid, araboascorbic acid, glucoascorbic acid, fucoascorbic
acid, glucoheptoascorbic acid, xyloascorbic acid,
galactoascorbic acid, guloascorbic acid, alloascorbic acid,
10 erythroascorbic acid, 6-desoxyascorbic acid, and esters and
salts thereof.

36. The composition according to Claim 34 or 35,
wherein the content of the ascorbic acid is not
15 higher than 30% by weight based on the system excluding
reduced coenzyme Q₁₀.

37. The composition according to any one of Claims
34 to 36,
20 wherein the fat and oil is a phospholipid.

38. The composition according to Claim 37,
wherein the phospholipid is in a liquid form.

39. The composition according to any one of Claims
25 34 to 38
which further comprises a surfactant other than
polyglycerol fatty acid esters.

40. The composition according to Claim 39,
30 wherein the surfactant other than polyglycerol fatty
acid esters is a Tween or Span species.

41. The composition according to Claim 39 or 40,
35 wherein the content of the surfactant other than

polyglycerol fatty acid esters is not higher than 90% by weight based on the system excluding coenzyme Q₁₀.

42. The composition according to any one of Claims
5 29 to 41,

wherein the content of reduced coenzyme Q₁₀ in the composition is higher than 5% by weight.

43. The composition according to any one of Claims
10 29 to 42,

wherein any oxidation product derived from a reducing agent to reduce oxidized coenzyme Q₁₀ is substantially absent.

44. The composition according to any one of Claims
15 29 to 43,

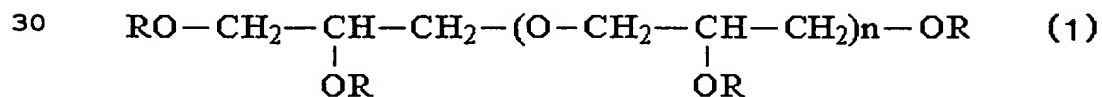
wherein the reduced coenzyme Q₁₀ is an externally added one.

45. The composition according to any one of Claims
20 29 to 44,

wherein the fat and oil and/or polyol is one accepted for food or pharmaceutical use.

46. The composition according to any one of Claims
25 29 to 45,

wherein the polyglycerol fatty acid ester is represented by the following formula (1):



in the formula, n represents an integer of 1 to 29 and the
35 four R's each independently represents a fatty acid residue

containing 2 to 22 carbon atoms or a hydrogen atom,
exclusive of the case where all R's are hydrogen atoms.

47. The composition according to any one of Claims
5 29 to 46,

wherein the content of the polyglycerol fatty acid
ester is not lower than 1% by weight based on the system
excluding coenzyme Q₁₀.

48. The composition according to any one of Claims
10 29 to 47,

wherein the content of the polyglycerol fatty acid
ester is not higher than 50% by weight based on the system
excluding coenzyme Q₁₀.

49. The composition according to any one of Claims
15 29 to 48,

wherein the polyglycerol fatty acid ester has an HLB
value of 4 to 12.

50. The composition according to any one of Claims
20 29 to 49,

wherein the ratio (number of fatty acid residues in
polyglycerol fatty acid ester)/(degree of polymerization of
25 glycerol) is 1/4 to 1/2.

51. The composition according to any one of Claims
29 to 50,

wherein the fatty acid residue or residues in the
30 polyglycerol fatty acid ester each contains not less than 8
carbon atoms and the degree of polymerization of glycerol
is not higher than 10.

52. The composition according to any one of Claims
35 29 to 51,

wherein the polyglycerol fatty acid ester is a diglycerol fatty acid ester.

53. The composition according to Claim 52,
5 wherein the diglycerol fatty acid ester comprises at least one species selected from among diglycerol monocaprate, diglycerol monolaurate, and diglycerol monooleate.

10 54. The composition according to Claim 53, wherein the diglycerol fatty acid ester is diglycerol monooleate.

55. The composition according to any one of Claims
15 29 to 54 which is of the self-emulsifiable type.

56. The composition according to any one of Claims
29 to 55
20 which is prepared or stored in a deoxygenized atmosphere.

57. The composition according to any one of Claims
29 to 56
25 which is processed in an oral dosage form.

58. The composition according to Claim 57,
said dosage form being capsules.

30 59. The composition according to Claim 58,
said capsules being soft capsules.

60. The composition according to Claim 58 or 59,
said capsules being packed in a phial, bottle,
35 plastic bag, aluminum laminate bag, PTP packaging, three

side-sealed packaging, four side-sealed packaging, strip packaging, aluminum shaped packaging or stick packaging.

61. The composition according to any one of Claims
5 29 to 60,

wherein the percent retention of reduced coenzyme Q₁₀
after 3 days storage in the air at 40°C under a light-
shielded condition is not lower than 70%, with the percent
retention in the corresponding composition composed of
10 reduced coenzyme Q₁₀, the fat and oil and/or polyol alone
after storage under the same conditions being taken as 100%.

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